We claim:

1. A computer graphics image rendering method, comprising:

as a precomputation, calculating data of macro-scale radiance transfer coarsely sampled over a surface of a modeled object;

as a precomputation, calculating data of meso-scale radiance transfer finely sampled over a meso-structure texture patch mapped over a surface of the modeled object;

based on a combination of the macro-scale radiance transfer data and the meso-scale radiance transfer data, evaluating radiance transfer over at least a portion of the surface of the modeled object from a lighting environment for a view direction; and

producing an image of the modeled object as lit according to the radiance transfer evaluation.

2. The computer graphics image rendering method of claim 1 wherein the meso-scale radiance transfer data is a height field.

3. The computer graphics image rendering method of claim 1 wherein calculating the meso-scale radiance transfer data comprises:

producing a radiance transfer texture encoding response to incident lighting expressed as a linear sum of lighting basis functions at a location on the meso-structure texture patch; and

producing a spatial index map to map the locations on the meso-structure texture patch onto the surface of the modeled object, via a precomputed texture synthesis.

4. A method of computer rendering of a graphics image of a modeled object in a lighting environment combining macro- and meso-scale effects, comprising:

for a location on a surface of the modeled object viewed from a view direction in the graphics image, determining lighting transferred by the object at the location from the lighting environment as a function of a lighting basis function representation of lighting

incident on the object from the lighting environment, a representation on the lighting basis of the radiance transfer of the object's surface sampled at a macro-scale, and a representation on the lighting basis of the radiance transfer of a meso-structure of the object's surface sampled at a meso-scale; and

producing an image of the modeled object in the lighting environment having the location on the modeled object surface lit according to the determined transferred lighting.

5. The method of claim 4 wherein the representation of the radiance transfer of the object's surface sampled at a macro-scale is a pre-computed radiance transfer matrix.

6. The method of claim 4 wherein the representation of the radiance transfer of a meso-structure of the object's surface sampled at a meso-scale is a radiance transfer texture.

7. The method of claim 4 wherein the representation of the radiance transfer of a meso-structure of the object's surface sampled at a meso-scale comprises a radiance transfer texture encoding response to incident lighting expressed as a linear sum of lighting basis functions at a location on a meso-structure patch, and a spatial index map mapping from locations on the surface of the modeled object to locations on the meso-structure patch, and wherein the spatial index map operates as an index to the radiance transfer texture.

8. The method of claim 4 wherein the function is $B(q(u_p), v_p) \cdot (M_p L)$, where B is a radiance transfer texture encoding response at a location on a meso-structure patch in a view direction v_p to incident lighting and indexed via an id map $q(u_p)$ that maps locations on the surface of the modeled object to locations on the meso-structure patch, where M_p is a precomputed radiance transfer matrix encoding radiance response of the location on the surface of the modeled object to incident lighting L of the lighting environment.

9. Computer-readable data carrying media having encoded thereon bi-scale radiance transfer data for a modeled object for use in computer rendering of images of the modeled object in a lighting environment, the bi-scale radiance transfer data comprising:

macro-scale transfer matrices for a plurality of locations sampled at a macro-scale on a surface of the modeled object, the macro-scale transfer matrices representing radiance transfer including global effects of a respective location of the surface of the modeled object to incident lighting expressed on a lighting basis;

a meso-scale radiance transfer texture representing radiance transfer of a plurality of locations sampled at a meso-scale across a meso-structure patch for a plurality of views and lighting environments; and

an id map representing a mapping of the meso-structure patch over at least a portion of the surface of the modeled object.

10. The computer-readable data carrying media of claim 9 wherein the global effects comprise self-shadowing and interreflection of the modeled object.

11. A computer system for rendering graphics images of a modeled object, comprising:

a macro-scale lighting simulator operating to perform a lighting simulation of the modeled object to produce a set of macro-scale radiance transfer matrices for a set of macro-scale sampled locations over a surface of the modeled object representing radiance response including global effects to incident lighting at the respective macro-scale sampled locations;

a meso-scale lighting simulator operating to perform a lighting simulation of a meso-structure patch to produce a radiance transfer texture representing radiance transfer of a set of meso-scale sampling locations over a meso-structure patch for a plurality of views and lighting environments;

a texture synthesizer operating to synthesize the meso-structure patch over at least a portion of the modeled object to produce an id map representing a mapping of the meso-structure patch to the portion of the modeled object; and

an image rendering engine operating to determine lighting from a lighting environment for each of a plurality of viewed locations on the modeled object in an image as a function of incident lighting from the lighting environment, the set of macro-scale radiance transfer matrices, and the radiance transfer texture as indexed by the id map; and

a display driver operating to present the image of the modeled object in the lighting environment with the determined lighting.